Junior Computer Science

code-it.co.uk

Car Park Barrier

Scenario

A local supermarket has a car park that is being increasingly used by local businesses for employer parking. This has meant that some supermarket customers are unable to park. The supermarket are investigating various forms of barrier control.

Car parking spaces

Barrier
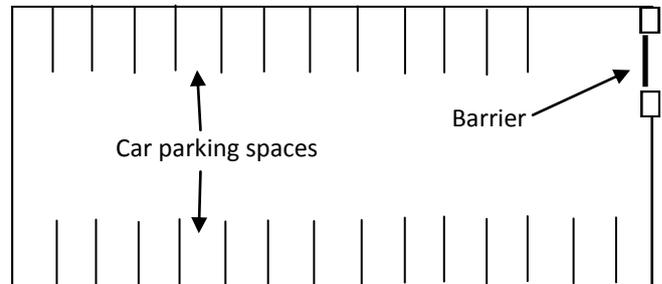
Differentiation and Assessment for Learning At the beginning of each session the *learning intention sheet* is shared and the learning journey expanded through success criteria. Pupils feed their progress back to the teacher through annotating this sheet as they cover the programming challenges and with faces at the end of the lesson. Teachers can also annotate the sheet to indicate those who need more or less help in future lessons. These extra resources can be found on the code-it.co.uk website.

Don't make a barrier yourself or pupils will copy it taking away the building and design part of the challenge

Extension

5a, Answer question about sensor model limitations

5, Program barrier to detect car, lift, wait 10 seconds and lower

4, Program barrier warning sound

3, Program barrier to lower and stop

2, Program barrier to lift and stop

1, Build barrier

Support

Learning Path

National Curriculum Coverage
-**design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems**; solve problems by decomposing them into smaller parts
-**use sequence, selection, and repetition in programs**; work with variables and **various forms of input and output**
-use logical reasoning to explain how some simple algorithms work and to **detect and correct errors in** algorithms and **programs**

1, Build Barrier

Give pupils boxes of Lego Wedo one between two is ideal but one between three would work. Explain the scenario, you may wish to find a picture of a car park barrier or focus pupils on a barrier near them.
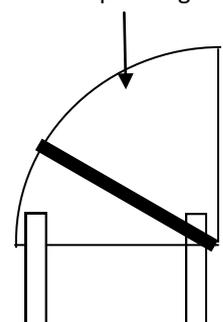
Add restrictions about not swapping Lego between boxes. Show pupils how the USB block, motor and distance sensor blocks fix together. Explain that the barrier will need to be light enough for the motor to lift. Ideally the barrier arm should rest on a pillar when not in use. They may also wish to find ways to limit its upwards movement so that the barrier points up but cannot travel a full 180 degrees hitting anyone behind the barrier. Give pupils time to build. Allow them to move on in groups when you have checked their models are safe and fulfil the design criteria.

Safe operating arc

Car Park Barrier P2

2, Program the barrier to rise and then stop

If pupils have completed the fan they won't find this activity totally new to them. However making it rise smoothly to the right position is not easy. If they have created a stop at the top so that the barrier can only move in a 90 degree arc the power settings are less crucial. The correct code will depend on the weight of the barrier.

```
when [r ▼] key pressed
motor power 40
motor direction this way
wait 0.2 secs
motor off
```

Sometimes pupils will use very different programming techniques and different blocks. As long as the code does what it needs to celebrate their creativity.

3, Program the barrier to lower and then stop

Programming the barrier to lower smoothly to the right position is not easy. If they have created a stop at the bottom so that the barrier won't hit the ground the power settings are less crucial. The correct code will depend on the weight of the barrier and the speed you program it to lower.

```
when [l ▼] key pressed
motor power 20
motor direction that way
wait 0.2 secs
motor off
```

4, Program barrier warning sound

Adding a sound block before the barrier rises or lowers can be done in may ways. Pupils could even record their own sounds if you have microphones.

5, Program the barrier to detect the car, lift the barrier, wait 10 seconds and lower barrier

The lifting and lowering of the barrier programming can be duplicated from challenge 2 and 3. Give pupils a while to struggle without help first as some will remember solutions to this type of issue with the fan. If they are still struggling after a suitable period of time give them the sensor help sheet. Explain that this is the working program as a flowchart. They will need to match the blocks on the sheet to the chart as well as reuse rise and lower blocks created earlier.

```
when [green flag] clicked
forever
  if < distance ▼ sensor value < 50 >
    motor direction this way
    motor power 40
    wait 0.2 secs
    motor off
    wait 5 secs
    motor direction that way
    motor power 20
    wait 0.2 secs
    motor off
```

Car Park Barrier P3

5, Program the barrier to detect the car, lift the barrier, wait 5 seconds and lower barrier continued

On the learning intentions sheet is a question about the design faults of the sensor model.

The design fault is that if a car takes longer than 5 seconds to move through the barrier it will come crashing down on the car. This could be fixed by a second sensor to detect when the car has left. Unfortunately you can't do this with Lego Wedo.